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BEFORE THE

FEDERAL COMMUNICATIONS COMMISSION
OFFICE OF SECRETARY

Federal Communications Commission

WASHINGTON, D.C. 20554

ET DOCKET NO. 96-2

In the Matter of

Amendment of the Commission's
Rules to Establish a Radio Astronomy
Coordination Zone in Puerto Rico

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RM-8165

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REPLY COMMENTS OF CORNELL UNIVERSITY

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SUMMARY

The few commenters who oppose the institution of a Puerto Rico Coordination Zone have failed to understand that the implementation and delivery of communication services throughout the Commonwealth of Puerto Rico will not be impeded by the new rules. The fears that costs and delays will result from the notification and coordination contemplated by the rules are misplaced. Even though Arecibo Observatory presently relies on FCC Public Notices, the information which the Observatory needs to conduct its interference analysis is rarely if ever contained in the Notices. The costs of providing the Observatory with copies of applications will be a minimal burden to applicants and early coordination will facilitate speedier action on applications rather than engender further delay.

The "reasonable efforts" required under the new rules is best defined by the Observatory's past experience with voluntary coordination with applicants. Such methods as pre-selection of antenna sites, taking advantage of terrain obstructions, avoidance of excessive power, directionalization, the installation of filter and shielding are a few examples of past accommodations by applicants which result in little additional cost. As experience with coordination grows, so will examples of steps which are "reasonable" in order to protect the Observatory.

The inability to specify the precise standards upon which the Commission and the applicants can determine whether there is a potential for harmful interference is largely due to the different ways and conditions under which interference is caused. Cornell proposes to prepare and provide interference guidelines--a suggestion offered by the Society of Broadcast Engineers--which will operate as a starting-point in the coordination discussions between applicants and the Observatory. These guidelines will be made available to any applicant and, if used in advance of preparation of the application, could reduce or eliminate costs or delays necessitated by retrofitting an already-assembled application.

The rules proposed by the Commission are entirely consistent with the public interest and should be adopted with the modifications suggested in Cornell's Comments and Reply Comments.

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REPLY COMMENTS OF CORNELL UNIVERSITY

Cornell University ("Cornell"), by its attorneys, hereby replies to comments which were filed in opposition to the Commission's proposal to establish a communications Coordination Zone covering the islands of Puerto Rico, Descheo, Mona, Vieques and Culebra, all within the Commonwealth of Puerto Rico. Cornell, the original proponent of this proceeding, supports the adoption of the Commission's proposal.

Preliminary Statement

The proposal advanced by the Commission to foster cooperation among radiofrequency spectrum users to eliminate or reduce out-of-band emissions falling within Radio Astronomy Service ("RAS") spectrum has received wide-ranging support, particularly by the scientific and engineering communities. Of the telecommunication services encompassed within the sixteen affected Parts of the FCC rules, only seven representatives offered any objections to the proposed Puerto Rico Coordination Zone rules affecting only four Parts. Even those who oppose the institution of the Coordination Zone mount no challenge to the significant role played by Cornell's Arecibo Observatory (the "Observatory") in radio/radar astronomy research or to the underlying public interest in protecting the world's largest radio/radar telescope. The opponents appear to be concerned that the coordination envisioned by the new rules would adversely affect the Commission's ability "to make available, so far as possible, to all the people of the United

States a rapid, efficient, Nation-wide, and world-wide wire and radio communications service...." as it is mandated to do under § 151 of the Communications Act.

The antagonists' fears, however, are misplaced. They misconstrue the principal focus and intended result of the proposed rules. Cornell does not seek, nor does the Commission propose, to impede the implementation and delivery of communications services in the Commonwealth. Cornell has not asked the Commission to institute a quiet communications environment nor to impinge on the use of spectrum by any entity in any of the affected services, and the new rules to not do so. The rules do, however, facilitate a cleaner communications environment so that radio astronomy spectral research can be conducted as free from unwanted interference as possible, and it is precisely this, and only this, that the Commission proposes to encourage.

The objections raised by several existing telecommunications service providers seem to fall into two general categories. First, it is argued that there is no need for applicants to notify the Observatory at the time applications are filed because FCC Public Notices and other research services are available to Cornell in the same manner and for the same expense as are available to other spectrum users and to the general public. One commenter believes that notification, if at all, should only be required of new applicants and applicants for major changes. To require applicants to send a copy of the technical portion of their applications, or to provide these data in some other written form, is an unnecessary and unwelcome burden and expense, claim two commenters. Two others state that allowing Cornell time to analyze applications, to work in cooperation with applicants and to employ reasonable methods to eliminate potentially harmful interference, will engender delay and expense--delay both in processing the applications and in provision of new or modified service to the public; expense in both added engineering and legal fees and the cost of equipment and other modifications needed to provide adequate protection to the Observatory.

In the second category are arguments that the standards imposed under the new rules, *i.e.*, that applicants make reasonable efforts to accommodate the Observatory (NPRM at ¶ 19) and make reasonable technical modifications to their proposals to resolve or mitigate potential interference (*Id.* at ¶ 21), are too vague and fail to delineate the specific requirements for obtaining FCC approval. The allegation is made that the Commission's reliance on the Observatory to conduct interference evaluations in good faith rather than to impose a specified interference standard, is misplaced because applicants will have no clear advance understanding of what steps must be taken to avoid harmful interference until after discussions with the Observatory. One commenter even suggests that the FCC's reluctance to impose such a standard cedes excessive power to

the Observatory and constitutes unlawful delegation of the authority vested in the Commission under the Communications Act. Finally, a telephone company, a paging company and an association of amateur operators complain that the new rules would unreasonably burden their respective services. Cornell's Reply Comments address these objections.

I. The Notification Requirement

Three parties object to the proposed requirement that applicants send copies of the technical portion of their applications to the Observatory. The Puerto Rico Telephone Company ("PRTC") asserts that "[a]t bottom, Cornell's proposed rules are an attempt to shift the limited costs of reviewing the Commission's public notices from itself to virtually all other users...." PRTC Comments at p. 2. PRTC argues that existing sources of information such as FCC Public Notices and other information service providers are available to the Observatory and their use will achieve the same results as the notification required by the proposed rules. *Id.* at pp. 5-6. Celpage, Inc. ("Celpage") asserts that "[l]ike all other parties, the Observatory is entitled to no less, and no more notice" than what is contained in FCC Public Notices. Celpage Comments at p. 11. The Asociacion de Radiodifusores de Puerto Rico ("PRBA") believes that these Public Notices are adequate notification for the Observatory's purposes, giving it adequate time to object under existing procedural rules. "Cornell has far more resources than any of the members of PRBA," it alleges, "and the task of monitoring these notices cannot be plausibly characterized as an excessive burden." PRBA Comments at p. 3. On the other hand, neither the American Radio Relay League, Inc. ("ARRL") nor the Society of Broadcast Engineers, Inc. ("SBE") object to the notification requirements outlined in the NPRM. ARRL Comments at p. 2; SBE Comments at pp. 2-3.

Cornell continues to believe that applicants should be required to provide the Observatory with copies of the technical portions of their applications. Although FCC Public Notices are available to the Observatory and are being used by the Observatory staff to identify potential problems, they do not contain all of the relevant technical to assist the Observatory in its analysis.¹ Nor is their use a foolproof method of identifying all possible sources of interference. As some commentators note, not all applications are listed in FCC Public Notices because prior FCC approval is not required and some

¹ At most, these Notices identify the frequency and the name of the applicant but not where to contact it. Neither do they reveal the terrain elevation at the transmitter site, antenna directionalization and gain, type of emission, nor the center of radiation of the antenna. Sometimes, but not always, power, coordinates and antenna heights are listed in the Notices.

applications do not ask for specific technical data.² *See, e.g.*, Comments of the Puerto Rico Amateur Radio League, Inc. ("PRARL") at p. 2; Comments of P.R./V.I. Volunteer Frequency Coordinators, Inc. ("PR/VI VFC") at p. 1; and Comments of Celpage at p. 8. Obtaining copies of the applications is time-consuming and after sifting through an assortment of applications to identify those which are potentially harmful, the Observatory cannot contact the applicant until well after the application has been filed.

One of the essential goals of the proposed rules is to facilitate earlier review of applications by the Observatory and timely coordination so that action on an application or provision of service will not be unduly delayed. Simply put, the earlier the coordination, the earlier the provision of communications services.³ If unwarranted and costly delays can be avoided by early notification and coordination, any additional expense to applicants for copying and transmitting relevant data to the Observatory should be minor and not unduly burdensome. It is instructive to note that Cornell has shouldered significant expenses of its own. Interference experienced by the Observatory has required an increasing amount of funding and allocation of resources that would better be devoted to pure scientific research. Valuable staff time is spent identifying sources of interference and taking appropriate steps to elicit protection of the Observatory. The Gregorian Upgrade, which Cornell cited in its Comments, was funded by NSF and NASA at a cost of \$22.8 million, and was in large part designed to reduce or eliminate some sources of interference.⁴ On the other hand, the magnitude of increased sensitivity of the telescope after completion of the Upgrade will mean a corresponding increase in the susceptibility of the Observatory to interference.⁵ Cornell considers these and other expenditures, incurred by Cornell and by others on its behalf, to be part of the cost of doing business in Puerto Rico. So too, must commercial and other spectrum users factor in an allowance for reasonable contributions to a clear telecommunications

² PRBA is only partially correct in its assertion that "major modifications are most likely to affect other spectrum users and the public." PRBA Comments at p. 6. Minor modifications include power increases, increases in antenna height among other changes, and could have a potentially harmful impact on Observatory operations. For this reason, Cornell continues to believe that notification and coordination requirements of the rules should encompass applications for new services and all applications for modification of existing services.

³ Technical information provided to the Observatory prior to the filing of the application will be kept in confidence by the staff and will not be shared with any third party before filing. This commitment should satisfy the confidentiality concerns expressed by the SBE (Comments at p. 3).

⁴ This investment must surely meet Celpage's demand that the Observatory "take 'reasonable' measures to avoid interference...." Celpage Comments at p. 5.

⁵For this reason, the local zoning regulations do not adequately protect the Observatory and need to be augmented by the FCC's proposal. *See* Comments of PRTC at p. 4 and Comments of Celpage at p. 13.

environment--one which promotes rapid, efficient delivery of service and which does not inhibit the ability of the Observatory to conduct critical research.

II. The "Reasonable Efforts" Standard

Several parties object to what they view as the absence of a specific definition of the requirement that an applicant make "reasonable efforts to resolve potential interference problems with the Observatory" (NPRM at ¶ 20) and make "reasonable technical modifications to its proposal in order to resolve or mitigate the potential interference problem" (NPRM at ¶ 21). PRTC argues that the Commission's proposal does not provide adequate notice under the Administrative Procedure Act, 5 U.S.C. § 553 (b) (3) and that "nature of the duties that would be required to address interference" are unknown, adding uncertainty, delay and obstacles not affecting other telecommunications services on the mainland United States. PRTC Comments at pp. 9-10. Similarly, Celpage asserts that "[w]ithout a clear understanding of what the applicant is required to do, there will always be a chance that applicants will ultimately be denied. An applicant must know what it must do to get a grant." Celpage Comments at p. 5. The SBE suggests that the Commission define the term "reasonable efforts" to be those that do not cause delay or increase an applicant's expenses unless the Observatory agrees to reimburse those expenses. Modifications resulting in delays or imposing expenses would be "unreasonable" and need not be implemented by an applicant. SBE Comments at p. 3.

There is little doubt that in some cases, a modification proposed late in the application processing stage would cause some delay and that some increased engineering and legal costs could be incurred. The Observatory, which is not as flush with financial resources as some parties suggest, continues to believe that the costs will be moderate and the delays minimal. The right to use spectrum is not unfettered.⁶ For example, communications services must be designed to avoid interference with other users, to provide a minimum level of acceptable service and in so doing, avoid adverse impact to natural resources protected by the Commission's environmental rules. The fees expended for professional assistance and other outlays attendant to obtaining FCC authorizations and meeting FCC requirements are part of the cost of doing business. So long as the restrictions placed on use of spectrum are consistent with the public interest, convenience and necessity, the requirements imposed under the proposed rules are a valid exercise of administrative authority. Cornell submits that proposed rules promote the public interest. The procedures outlined in the NPRM do not restrict other services from

⁶ This is true as well for those frequencies which are auctioned, Celpage argument to the contrary notwithstanding. Celpage Comments at n. 5.

full and effective use of their allocated frequencies;⁷ they merely facilitate clean use of those frequencies by affected services so that radio astronomy research can be as free of intermodulation and harmonic interference as is reasonably possible.⁸

Early coordination with the Observatory and accommodation of its needs should greatly minimize any additional costs and delays.⁹ In this regard, and as more clearly spelled out in the next section of this Reply, the Observatory will prepare and make available to anyone who requests it, an informational publication which will provide some technical data defining interference limits which applicants may take into consideration in engineering their applications.

Listing all specific steps which would constitute "reasonable efforts" by licensees is an impossible task because different interference potential may require different treatment. Clearly, however, early contact with the Observatory, especially prior to filing the application, will reduce the necessity for more costly changes. Advance exchange of application specifics and early interference analyses would facilitate design of optimal technical parameters which protect the Observatory. For example, as Cornell pointed out in its Response to Late-Filed Comments filed June 9, 1993, it coordinated with the PRTC to locate a mutually acceptable transmitter site and antenna pattern for a cellular cell site in Utuado near Arecibo. The PRTC also agreed to phase out a microwave link which traversed directly across the Observatory. Discussions between the Observatory and an LPTV applicant near Arecibo prior to the filing of its application resulted a mutually acceptable antenna system design which utilized terrain shielding and a directional antenna pattern. Cornell's Response at pp. 2-3. As a track record is established for coordination, it may then be easier to outline specific steps. Until such a record is compiled, however, the steps outlined in the NPRM at ¶ 5 and those cited as examples

⁷ The Observatory and its staff use some of the services affected by this rulemaking proceeding. They use the telephone, cellular services, watch television and cable, listen to radio and several are active amateur operators. They would not benefit from undue restrictions on communications on which they rely and eschew any intention of consigning "these critical services to a second class environment." PRTC Comments at p. 2.

⁸ The ARRL's argument (at footnote 1 of its Comments) notwithstanding, the basis for the Commission's proposal to exempt from the rules facilities operating above 15 GHz does not mean that amateur operations should be exempted as well. Clean use of amateur frequencies by amateurs, and not Observatory use of amateur frequencies, is the intent of the proposed rules.

⁹ The SBE agrees with this concept provided the Observatory makes interference guidelines available to applicants in advance (Comments at pp. 4-5). Cornell has agreed to make an information worksheet available. This approach will avoid the dire consequences of delayed deployment of new wireless and telephone services foreseen by the PRTC (Comments at pp. 12-13) and the costs and delays which offend Celpage (Comments at p. 4).

here, are sufficient notice to applicants of what the Commission expects to be "reasonable efforts" under the new rules.¹⁰

Retrofits are almost always more expensive than making adjustments at earlier in the planning stages. But with coordination occurring even late in the construction phase reasonable solutions can be found which are beneficial to the Observatory and of minimal expense to the applicant. In its Petition for Rule Making, Cornell cited its experience with WCCV-TV in Arecibo, which had been granted a construction permit before the Observatory was aware of its application, as an example of the need for notification under the proposed rules. Later, in its Comments, WCCV-TV was cited as an example of the success of coordination. After discussions and informal negotiations were conducted between the Observatory and the applicant, filtering and case shielding were installed to eliminate second harmonic intrusion.¹¹ These are good examples of "reasonable steps" that a licensee can take and meet its burden under the proposed rules. In any event, under the proposed rules, the applicant may refuse to take steps it considers unreasonable¹² and the Commission may thereafter be asked to make a determination. If the Commission finds that the applicant has expended reasonable efforts, it can expect to receive FCC authorization and the matter will then be put to rest. In no circumstance does the Observatory have the final say nor can it exercise a "veto" power.¹³

III. The Interference Standards

Several parties have voiced their objection to the Commission's proposal to not adopt a specific interference standard, but rather to insist that the Observatory "make a good faith effort to evaluate the potential for interference based on all relevant factors and

¹⁰ Examples such as those given plainly meet the requirements of the Administrative Procedure Act, 5 U.S.C. § 553(b)(3) and the specificity required under the precedent cited by PRTC at pp. 8-9 of its Comments. They serve to tell Celpage what it must do to get a grant. See Celpage Comments at p. 5.

¹¹ In this instance, the coordination was voluntary. But such exemplary action by WCCV-TV does not undercut the need for mandatory coordination. Both the PRTC, which has voluntarily coordinated with the Observatory on past occasions, and ARRL, make this tongue-in-cheek argument. PRTC Comments at p. 5; ARRL Comments at p. 4. Not every service provider has been as cooperative with the Observatory as have PRTC and ARRL.

¹² For example, modification of a station's beam pattern which materially compromises "the integrity of a transmission to the very areas intended to be served under a Commission license" would undoubtedly be unreasonable. See PRTC Comments at p. 10. So too would requiring a "white area" or "dead spots" of no cellular service near the Observatory be unreasonable. See Celpage Comments at pp. 7, 10. Of course, this is not what Cornell envisioned in its petition for rulemaking. It fully supports services which confine their spectrum use to their own allocated frequencies.

¹³ Contrary to Celpage's reading of the NPRM, the Observatory is clearly obligated to deal in good faith with applicants. Compare Celpage Comments at pp. 5-6 with NPRM at ¶ 27. Nor can the Observatory exercise any authority bestowed on the Commission. Celpage Comments at p. 6. Any disputes not resolved by mutual agreement can be presented to the Commission for its ultimate resolution.

... cooperate with the licensee to assure minimum disruption or inconvenience to all concerned." NPRM at ¶ 27. The PRTC argues that the examples of "reasonable efforts" cited by the Commission are too vague and that the range of options is "dramatic," perhaps compromising the "integrity" of its much-needed service. PRTC Comments at p. 10. Celpage believes that "[u]nder the proposed rules, the Observatory's determination of what constitutes 'harmful interference' to its operations is apparently controlling" and is thus an impermissible delegation of the Commission's authority. Celpage Comments at pp. 5-6.

The difficulty of specifying the precise interference criterion is a product of the various ways and the conditions under which interference is caused.¹⁴ Transmitter location and signal intensity are certainly part of the equation. But so too are time of day, temperature, weather conditions and the frequencies being observed by the Observatory. The only criteria which defines the levels of harmful interference in RAS bands is ITU-R. RA.769. Cornell pointed out in its Comments that this criteria can only serve as a guideline for non-radio astronomy frequencies. Cornell Comments at p. 6. The best course is to permit a dynamic definition; that is, one that leads to a reasonable solution that addresses the particular interference involved at that point in time. The standards will necessarily change with the passage of time and with experience gained in coordinating with other spectrum users.

The SBE suggests a possible solution for the need of applicants to have some guidance in advance of preparing an application. This solution would "not necessarily be permanently embedded in the FCC Rules," SBE states, but rather, the:

...guidelines could be published by the Arecibo Observatory to provide information regarding the level of protection that the Observatory desires and believes to be reasonable. Since these would be guidelines rather than statutory rules, there would remain flexibility for both sides to still treat potential interference on a case-by-case basis, and for broadcasters to appeal the matter to the Commission, in the event complying with the guideline would represent an unreasonable burden on the ability of a broadcaster to fulfill its obligation to provide service to its community of license or upon its right to build the best possible facilities otherwise consistent with the FCC Rules. SBE Comments at pp. 9-10.

¹⁴ The PRBA agrees that the precise definition of harmful interference is "not desirable" but urges that the Commission, and not the Observatory, be the final arbiter of just what constitutes harmful interference. PRBA Comments at pp. 4-5. This is precisely what the proposed rules accomplish; if an applicant disagrees with the Observatory's analysis, it is free to terminate the coordination process and proceed with regular Commission application processing.

Cornell recognizes the difficulties faced by applicants attempting to engineer facilities without advance knowledge of the Observatory's interference limits. In an attempt to meet the objections regarding vagueness or lack of notice, in following the suggestion of the SBE, Cornell will prepare for dissemination to all interested applicants and telecommunications service providers, an information sheet which will show the maximum predicted power density levels which the Observatory believes can be produced without causing harmful interference. In all likelihood, certain assumptions will have to be made and the levels for the affected bands may be averages which will have to be refined (and redefined) depending on the specific application involved. It can be viewed as a starting point for the determination of potential interference, but not necessarily as a hard-and-fast immutable standard. With the inherent inability to establish one standard for a multitude of circumstances, this is probably the best method of alerting spectrum users of the existence of the Observatory and of the necessity of tailoring applications to protect the Observatory.

IV. Specific Spectrum Users

Amateurs. The ARRL is adamant that its members provide a valuable communications service during hurricanes and other emergencies¹⁵ and that the Observatory's fears regarding potential interference from amateurs are "inchoate" and "unquantified." ARRL Comments at p. 3. ARRL complains that there is no basis for application of the new rules to amateur repeaters and beacons when similar operations by the Civil Air Patrol are exempted. ARRL questions the basis for imposing a notification requirement on temporary broadcast operations within a 4-mile radius of the telescope and a similar limit on amateur operations within a 10-mile radius of the Observatory. *Id.* at p. 4. ARRL asserts that the voluntary cooperative efforts between the Observatory and amateurs cited by the Commission are mutually exclusive with the proposed rules and that there is no showing of any interference, particularly since Civil Air Patrol beacons are proposed to be exempted.

ARRL's arguments here were also raised at an earlier stage in this proceeding and were disposed of by the Commission in the NPRM at ¶¶ 30-32. The Commission decided to retain the notification requirements for short-term broadcasting auxiliaries and

¹⁵ The PRBA requests an exemption for applications for Special Temporary Authority (STA) to operate in a manner different than that for which they are licensed, citing emergency situations as a valid reason for not including STAs within the ambit of the rules. PRBA Comments at p. 7. In emergency situations, the Observatory will not likely request modifications which deprive Puerto Ricans of emergency services. During emergencies such as hurricanes, the Observatory itself depends on these services. But all STA situations are not emergencies from the standpoint of the general public and it would better serve the public if the Observatory is permitted to exercise "good faith" judgment in raising interference concerns. In cases of a dispute, the matter can be presented to the Commission for prompt resolution.

for new repeater and beacon stations within a 4-mile and a 10-mile radius of the Observatory, respectively, because of an agreement reached between Cornell and the Puerto Rico Amateur Radio Club. Under that agreement, amateur operations within the notification zones were not exempted because of the increased potential that operations closer to the Observatory could cause interference. The agreement also provided that Cornell would be given access to the Club's relay and beacon station data maintained by the Club as a clearinghouse. The terms of this agreement are confirmed in the Comments filed by PR/VI VFC and by the PRARL. Both of these parties request that the Commission designate an official frequency coordinator, formalizing the prior agreement with Cornell, so that proper notification can be given to the Observatory.

The Observatory has had discussions with Victor Madera, the Liaison/Secretary of PR/VI VFC and Secretary of PRARL, subsequent to the filing of their Comments. As a result of these discussions, Cornell is willing to rely on PR/VI VFC if it is designated as the official FCC coordinator for all amateur operators in the areas affected by the proposed rule. In this role, the PR/VI VFC would be the central clearing house for all amateur operators on the island and nearby islands and would be the principal point of contact for the Observatory. The Observatory envisions that as information is received by PR/VI VFC, that organization would share relevant technical information with the Observatory which would then conduct an interference analysis and advise PR/VI VFC of any potential or actual interference. The PR/VI VFC would then communicate directly with the particular amateur operation and facilitate amelioration of the problem. Cornell still urges the Commission, however, to revise Part 97 of the Commission's rules to reflect that coordination between amateurs and PR/VI VFC and amateurs and between PR/VI VFC and the Observatory is mandatory and that amateurs should be prepared to take all reasonable measures to protect the Observatory. Any disputes which cannot be resolved with the official coordinator may be brought to the Commission for its determination.

Paging. Celpage raises the specter of threats to the health, safety and welfare of Puerto Rican residents because "[h]ospitals, ambulance services, local police departments and the like can ill-afford the 'dead spots' in coverage that will surely result if their paging carrier is required to design its system around the Observatory." Celpage Comments at p. 10. The simple answer to this rather alarming prospect is that no "dead spots" will be created if the proposed rules are adopted. Celpage will continue to be able to provide fast, efficient and effect paging services to all of Puerto Rico, including Arecibo, on the frequencies specifically allocated by the Commission. In appropriate cases, Celpage may be asked to take reasonable steps to reduce or eliminate spurious emissions, be they

intermodulations or harmonics, which splatter beyond the fundamental paging frequencies and into the fundamental RAS frequencies. A cleaner communications environment, and not a quieter milieu, is all the Observatory seeks to accomplish under the new rules.

Broadcast. The SBE continues to hammer away at what it considers to be a "wildly incorrect" claim that the Observatory has nearly direct line-of-site to 70 percent of the island. The claim is taken from the NPRM (§ 4) and the SBE conveniently ignores the last phrase of the first sentence which asserts that the claim applies as well "to the communications transmission facilities located there." This same argument was raised by the SBE in terms of terrain shielding in its Comments dated February 18, 1993 at pp. 2-3. Cornell responded to the SBE in its Reply to Comments filed March 5, 1993 at p. 5, by pointing out that its vulnerability to signals was due to the high elevation of the Observatory platform, to the high elevation of many transmitters necessary to provide usable service throughout the island's rugged terrain, and to the fact that little natural shielding existed between the Observatory and these radiation sources. The point then and the point now is simply that whether the term is "line-of-site" or "shielding" is used, the Observatory is exposed to the unobstructed signals of a vast majority of actual Puerto Rico transmission sources and not to ground level terrain.


The SBE also suggests that the Observatory employ a propagation model such as the Terrain Integrated Rough Earth Model (TIREM) in cases where interference analysis takes into account terrain obstructions. Cornell is in full agreement with SBE and has in fact routinely used TIREM for several years. A member of the SBE helped install the necessary software so that the Observatory's computers can include the TIREM algorithm.


Conclusion

Because of the importance of the Arecibo Observatory, in size, sensitivity and science, there is a need to protect the radio/radar astronomy facility from harmful emissions which interfere with radio astronomy research. The proposed rules accomplish this goal in a manner which is of minimal burden to telecommunications services and

which does not interfere with the provision of first class service to residents of the Commonwealth of Puerto Rico. The cooperation, coordination, good faith, and reasonableness imposed by the rules are entirely consistent with the public interest, and should, therefore, be adopted.

Respectfully submitted,
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April 29, 1996

CERTIFICATE OF SERVICE

I, Mima Shanor, a secretary in the offices of Reynolds and Manning, P.A., hereby certify that on this 29th day of April, 1996, copies of the foregoing "Reply Comments of Cornell University" were deposited with the U.S. Postal Service, first class postage prepaid, addressed to the following:

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